TITLE OF THE INVENTION

# DISPLAY APPARATUS

## CROSS-REFERENCE TO RELATED APPLICATION

**[0001]** This application claims the benefit of US Provisional No. 60/413,776 filed September 27, 2002, and Korean Application No. 2002-68264 filed November 5, 2002 in the Korean Intellectual Property Office, the disclosures of which are incorporated herein by reference.

## BACKGROUND OF THE INVENTION

### Field of the Invention

**[0002]** The present invention relates, in general, to a display apparatus, and in particular, to a display apparatus having an improved structure of conveniently adjusting a position (that is, the height) of a monitor body.

### Description of the Related Art

**[0003]** Recently, display apparatuses have been increasingly demanded as personal computers have come into wide use. In order to cope with such demands from a variety of consumers, display apparatuses employing a variety of functions have been provided to increase the consumers convenience when using them.

**[0004]** As an example, Korean Utility Model Registration No. 20-279427 discloses a display apparatus including a monitor body, a base, a stand to stand on the base, a plate fixed on a bracket in a rear of the monitor body and extended downward, a guide plate fixed on the stand and having a pair of rail grooves, and a slider having a projection to be inserted into the rail grooves of the guide plate and to move up and down along the guide plate. The display apparatus also includes a pusher fixed to a lower part of the slider, and being provided with a semi-circular seating hole in a bottom thereof. The display apparatus includes a spiral spring having a first end fixed to the stand and a second end displaced in the seating hole of the pusher as curled, to elastically support the monitor body in a direction opposite to a weight of the monitor body.

**[0005]** In the conventional display apparatus with the above configuration, since friction is generated when the slider is moved along the guide plate, the slider connected to the monitor body is not smoothly moved along the guide plate when a user wishes to move the monitor

body downward. Therefore, the user may experience problems in adjusting the position of the monitor body.

**[0006]** In addition, friction is generated between a mounting place of the spiral spring and the spiral spring, and accordingly, the monitor body is not smoothly moved because of the spiral spring.

## SUMMARY OF THE INVENTION

**[0007]** Accordingly, it is an aspect of the present invention to provide a display apparatus having an improved structure of conveniently adjusting a position of a monitor body.

**[0008]** Additional aspects and advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

**[0009]** The foregoing and/or other aspects of the present invention are achieved by providing a display apparatus including a base part, a main body, a slider connected to the main body, a guide rail to stand on the base part, and to guide the slider to slide thereon to move the main body up and down, and at least one spiral spring having an elasticity enough to support a weight of the main body and to extend and contract in response to a movement of the slider.

**[0010]** According to an aspect of the invention, the guide rail is provided in a pair parallel to each other to stand on the base part at a predetermined distance from each other, and the slider is provided in a pair to correspond to the guide rail to be engaged with the guide rail.

**[0011]** According to an aspect of the invention, the display apparatus further includes a guide bracket to couple to the guide rail and a spring supporting block provided between the sliders. The spiral spring has a first end coupled to the guide bracket and a second end coupled to the spring supporting block.

**[0012]** According to an aspect of the invention, the spiral spring includes a wound part having a spiral shape and coupled to the guide bracket, and a coupling part extended from the wound part and coupled to the spring supporting block.

**[0013]** According to an aspect of the invention, the spiral spring includes a first spiral spring installed in front of the guide bracket, and a second spiral spring installed in the back of the guide bracket.

**[0014]** According to another aspect of the invention, the display apparatus includes a first accommodating part to accommodate the first spiral spring and provided on an inner front face of the guide bracket, a second accommodating part to accommodate the second spiral spring and provided on an inner rear face of the guide bracket, and third and fourth accommodating parts, each to accommodate the pair of guide rails and provided on both sides of the guide bracket.

**[0015]** According to yet another aspect of the invention, the display apparatus includes a supporting unit provided in the first and second accommodating parts to control extension and contraction of the first and second spiral springs. The supporting unit is provided with first and second rotational shafts installed transversely on the first and second accommodating parts, and first and second spring guides rotatably installed on the first and second rotational shafts on which the wound parts of the first and second spiral springs are respectively wound.

**[0016]** According to an aspect of the invention, the display apparatus further includes a ball bearing unit provided between the guide rail and the slider.

**[0017]** According to an aspect of the invention, the ball bearing unit includes a supporting pin disposed between the guide rail and the slider and positioned along a lengthwise direction of the guide rail, and a rolling ball rollably installed on the supporting pin between the guide rail and the slider and contacted with the slider by a rolling motion.

**[0018]** According to an aspect of the invention, the display apparatus includes a supporting bracket provided between the main body and the guide bracket and including a supporting part to support the main body, and an extended part extended downward from the supporting part and coupled to the pair of sliders by passing through the guide bracket.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0019]** The above and/or other aspects and advantages of the present invention will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompany drawings of which:

FIG. 1 is a rear perspective view showing an elevating state of a slider in a display apparatus, according to an embodiment of the present invention;

FIG. 2 is an exploded perspective view showing a main portion of the display apparatus shown in FIG. 1;

FIG. 3 is a rear perspective view showing a lowering state of the slider in the display apparatus shown in FIG. 3;

FIG. 4 is a front elevational view showing a lowering state of the slider in the display apparatus shown in FIG. 3; and

FIG. 5 is a sectional view of FIG. 3 taken along V-V.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0020]** Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiments are described below in order to explain the present invention by referring to the figures.

**[0021]** As shown in FIGS. 1 through 5, a display apparatus 1 according to the present invention includes a main body (not shown) to display pictures thereon, a base part 3 to sit on a mounting space (e.g., a table), a stand part 5 to stand on the base part 3, and a connection assembly 7 to connect the stand part 5 to a body bracket 6 fixedly coupled to a rear face of the main body.

**[0022]** To a lower part of the connection assembly 7 is coupled a supporting bracket 20 to support the connection assembly 7. The supporting bracket 20 has a supporting part 21 to support the connection assembly 7 and an extended part extended downward from the supporting part 21.

**[0023]** A pair of guide assemblies forming the stand part 5 are respectively displaced on both sides of an extended part 22.

**[0024]** Each of the guide assemblies includes a guide rail 11, and a slider 12 slidingly moved along the guide rail 11. A guide bracket 30 is displaced between the guide rail 11 and the supporting bracket 20.

**[0025]** The guide rail 11 is approximately shaped like a "U" when viewing a section of an inside thereof in which a ball bearing unit 14 is installed along a lengthwise direction. The ball

bearing unit 14 includes a supporting pin 15 displaced in the guide rail 11 along the lengthwise direction, and a rolling ball 16 coupled to the supporting pin 15 in a rotatable manner to contact the slider 12 (to be described later) by a rolling motion.

**[0026]** A bottom of the guide rail 11 is coupled to a stand supporting part 2 by screws 38. The stand supporting part 2 is installed on a top face of the base part 3 providing an accommodating space, and a top of the guide rail 11 is coupled to the guide bracket 30. The guide rail 11 is provided in a pair and is disposed in parallel to each other having a predetermined space therebetween.

**[0027]** A top of the slider 12 is coupled to the extended part 22 and a bottom of the slider 12 is coupled to a spring supporting block 13 to be described later. The slider 12 smoothly moves along the guide rail 11 as external wall faces of both sides of the slider 12 are contacted by a rolling motion with the rolling ball 16 within the guide rail 11. For example, the slider 12 may be drawn out from the guide rail 11 to a predetermined length by an upward movement along the guide rail 11.

**[0028]** Meanwhile, the extended part 22 is displaced over a space provided between a pair of sliders 12 which are separated from each other, and the spring supporting block 13 is displaced below the space.

**[0029]** The sliders 12 are coupled to both sides of the spring supporting block 13. First and second spiral springs 41 and 42, to be described later, are respectively coupled to a front face and a rear face of the spring supporting block 13 by screws 39. By this coupling, if the sliders 12 perform a sliding motion, the spring supporting block 13 coupled to the sliders 12 is moved together with the sliders 12. Since the first and second spiral springs 41 and 42 are coupled to the spring supporting block 13 moving together with the sliders 12, the first and second spiral springs 41 and 42 are extended and contracted according to the movement of the spring supporting block 13 coupled to the sliders 12.

**[0030]** An elasticity of the first and second spiral springs 41 and 42 is set to be equal to a weight of the main body. Preferably, the first and second spiral springs 41 and 42 may be formed of stainless steel with a thickness of 0.2mm to 0.35mm.

**[0031]** The first and second spiral springs 41 and 42 include a wound part 43 spirally wound and mounted to the guide bracket 30, and a coupling part 44 extended from the wound part 43 and coupled to the spring supporting block 13.

**[0032]** A first accommodating part 31 on which the first spiral spring 41 is installed is provided on an inner front face of the guide bracket 30, and a second accommodating part 32 on which the second spiral spring 42 is installed is provided on an inner rear face of the guide bracket 30. Third and fourth accommodating parts 33 and 34 to accommodate the pair of guide assemblies (i.e., the guide rails 11 and the sliders 12) are respectively provided on both sides of the guide bracket 30.

**[0033]** The tops of the guide rails 11 of the guide assemblies are inserted into the third and fourth accommodating parts 33 and 34 respectively and are fixed by screws 37.

**[0034]** On the first and second accommodating parts 31 and 32 are respectively provided a supporting unit to allow extension and contraction, that is, to allow the first and second spiral springs 41 and 42 to be unwound and wound.

**[0035]** The supporting unit includes first and second rotational shafts 51 and 52 transversely on the first and second accommodating parts 31 and 32, respectively, and first and second spring guides 53 and 54 made of plastic material, rotatably installed on the first and second rotational shafts 51 and 52, respectively, on which the first and second spring springs 41 and 42 are wound. Since the coupling part 44 of the first and second spiral springs 41 and 42 are coupled to the spring supporting block 13 connected to the sliders 12, the wound part 43 of the first and second spiral springs 41 and 42 are unwound along circumferences of the first and second spring guides 53 and 54 by a rotation of the first and second rotational shafts 51 and 52 when the sliders 12 and the spring supporting block 13 move downward. In response thereto, the coupling part 44 of the first and second spiral springs 41 and 42 moves downward along with the spring supporting block 13.

**[0036]** That is, the first and second spiral springs 41 and 42 are extended (see FIGS. 3 and 4). Conversely, the wound parts 43 of the first and second spiral springs 41 and 42 are wound along the circumferences of the first and second spring guides 53 and 54 by the rotation of the first and second rotational shafts 51 and 52 when the sliders 12 and the spring supporting block 13 move upward. In response thereto, the coupling part 44 of the first and second spiral springs

41 and 42 move upward along with the spring supporting block 13. That is, the first and second spiral springs 41 and 42 are contracted (see FIG. 1).

**[0037]** In light of the above configuration, an elevating process of the sliders 12 relative to the guide rails 11 will be described below.

**[0038]** It is assumed that an initial status of the display apparatus according to the present invention is as illustrated in FIG. 1. Thus, if a user holds the main body (not shown) and moves it downward so as to lower a position of the main body, the sliders 12 move downward along the guide rails 11 to contact the rolling ball 16 by a rolling motion. At this time, since the spring supporting block 13 is coupled to the sliders 12, the spring supporting block 13 moves downward in response to the downward movement of the sliders 12, and the coupling part 44 of the first and second spiral springs 41 and 42 coupled to the spring supporting block 13 moving downward, also moves downward.

**[0039]** The downward movement of the coupling part 44 of the first and second spiral springs 41 and 42 is possible because the spiral wound parts 43 of the first and second spiral springs 41 and 42 are respectively extended to be unwound along the circumferences of the first and second spring guides 53 and 54 in response to the downward movement of the coupling part 44 of the first and second spiral springs 41 and 42.

**[0040]** The above operation is done under the condition that the weight of the main body moves downward beyond the elasticity of the first and second spiral springs 41 and 42. If the user suspends the downward movement of the main body when the main body reaches a height that the user desires to position it while the main body is in downward movement, the main body will not move downward any more. That is, since the weight of the main body and the elasticity of the first and second spiral springs 41 and 42 are balanced, the movement of the main body stops (see FIGS. 3 and 4).

**[0041]** If the user holds the main body and moves it upward so as to raise the position of the main body, the balance between the weight of the main body and the elasticity of the first and second spiral springs 41 and 42 is not stable, and therefore, the main body moves upward in the same operation as described above. If the user suspends the upward movement of the main body when the main body reaches the height that the user desires to position it, the main body will not move upward any more since the weight of the main body and the elasticity of the first and second spiral springs 41 and 42 are balanced (see FIG. 1).

**[0042]** In the display apparatus 1 according to the present invention, the sliders 12 smoothly move along the guide rails 11 via the ball bearing unit 14, and easily adjust the position of the main body with the first and second spiral springs 41 and 42.

**[0043]** In the above-described embodiment, the first and second spiral springs 41 and 42 are provided. However, one spiral spring may be installed with the elasticity of the one spiral spring being set equal to the weight of the main body.

**[0044]** In the above-described embodiment, the number of spiral springs installed is two, that is, the first and second spiral springs 41 and 42. However, four spiral springs may be installed in the display apparatus according to the present invention. It should be noted that the number of spiral springs which may be installed in the display apparatus according to the present invention is not limited to two or four, but may be determined optionally by display apparatus makers.

**[0045]** As described above, according to the present invention, there is provided a display apparatus having an improved structure of conveniently adjusting a position of the main body because the slider may be slid smoothly along the guide bracket.

**[0046]** Although a few embodiments of the present invention have been shown and described, it will be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims and their equivalents.